

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No.: Unknown

Filing Date: Herewith

Applicant: Hitoshi Fukushima

Title: **FABRICATION OF SELF-ASSEMBLED MONOLAYERS**

Attorney Docket: 9319S-000311

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Hon. Commissioner of Patents and Trademarks  
Washington, D.C. 20231

**PRELIMINARY AMENDMENT**

Sir:

Prior to the examination of this application, please amend it as follows:

**IN THE SPECIFICATION**

Please delete the Abstract Section of the specification and replace it with the following abstract in clean form. Applicant includes herewith an Attachment for Specification Amendments showing a marked up version of the previous Abstract Section.

**ABSTRACT**

A self-assembled monolayer (SAM) is fabricated using either a semi-fluorinated sulphur containing compound, or a semi-fluorinated silane derivative and compressed carbon dioxide (CO<sub>2</sub>) as the solvent medium. The temperature and/or pressure of the compressed CO<sub>2</sub> may be varied during the fabrication process to improve the molecular packing density of the monolayer.

### IN THE CLAIMS

Please cancel claims 27-30.

Please amend Claims 1-6, 9-12, 13-16, 19-22, and 24-30 in accordance with the following rewritten claims in clean form. Applicant includes herewith an Attachment for Claim Amendments showing a marked-up version of each amended claim.

1. (AMENDED) A method of fabricating a self-assembled monolayer of a substance on a substrate comprising depositing the substance on the substrate using compressed carbon dioxide as a solvent medium for the substance.

2. (AMENDED) A method as claimed in claim 1, wherein at least one of pressure and temperature of the compressed carbon dioxide is selectively controlled so as to enhance a density of the self-assembled monolayer on the substrate.

3. (AMENDED) A method as claimed in claim 1 comprising the use of a co-solvent in combination with the compressed carbon dioxide.

4. (AMENDED) A method as claimed in claim 3, wherein the co-solvent comprises at least one of H<sub>2</sub>O, CH<sub>3</sub>OH, CF<sub>3</sub>OH, CF<sub>3</sub>CH<sub>2</sub>OH, CF<sub>3</sub>CF<sub>2</sub>OH, (CF<sub>3</sub>)<sub>2</sub>CHOH, CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, CHF<sub>3</sub>, CClF<sub>3</sub>, C<sub>2</sub>H<sub>6</sub>, SF<sub>6</sub>, Propylene, Propane, NH<sub>3</sub>, Pentane, <sup>i</sup>PrOH, MeOH, EtOH, <sup>i</sup>BuOH, Benzene, and Pyridine.

5. (AMENDED) A method as claimed in claim 1, wherein the substrate comprises a metallic substance.

6. (AMENDED) A method as claimed in claim 5, wherein the metallic substance comprises at least one of gold, silver, copper, iron, mercury, palladium, gallium arsenide, ferrous oxide, and indium tin oxide.

9. (AMENDED) A method as claimed in claim 7, wherein X comprises a thiol.

10. (AMENDED) A method as claimed in claim 7, wherein Y comprises a CF<sub>3</sub> functional group.

11. (AMENDED) A method as claimed in claim 7, wherein m and n lie within a range of 1 to 20.

12. (AMENDED) A method as claimed in claim 11, wherein m and n lie within a range of 5 to 10.

14. (AMENDED) A method as claimed in claim 7, wherein Y further comprises at least one of vinyl, styryl, acryloyl, methacryloyl and alkyne in combination with a spacer group.

15. (AMENDED) A method as claimed in claim 14, wherein the spacer group

comprises at least one of  $\text{CH}_2$  and  $\text{CF}_2$ .

16. (AMENDED) A method as claimed in claim 1, wherein the substrate comprises at least one glass, mica,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , and  $\text{Ga}_2\text{O}_3$ .

19. (AMENDED) A method as claimed in claim 18, wherein Si comprises at least one of  $\text{SiCl}_3$ ,  $\text{Si}(\text{OCH}_3)_3$ ,  $\text{Si}(\text{OCH}_2\text{CH}_3)_3$ ,  $\text{Si}(\text{OCH}_3)_2\text{Cl}$  and  $\text{Si}(\text{CH}_2\text{CH}_3)_2\text{Cl}$ .

20. (AMENDED) A method as claimed in claim 17, wherein Y comprises a  $\text{CF}_3$  functional group.

21. (AMENDED) A method as claimed in claim 17, wherein m and n lie within a range of 1 to 20.

22. (AMENDED) A method as claimed in claim 21, wherein m and n lie within a range of 5 to 10.

24. (AMENDED) A method as claimed in claim 17, wherein Y further comprises at least one of vinyl, styryl, acryloyl, methacryloyl and alkyne in combination with a spacer group.

25. (AMENDED) A method as claimed in claim 24, wherein the spacer group comprises at least one of  $\text{CH}_2$  and  $\text{CF}_2$ .

26. (AMENDED) A method as claimed in claim 17, wherein the self-assembled monolayer has an ellipsometry thickness of about 30Å and a water contact angle of about 110°.

## REMARKS

The purpose of this preliminary amendment is to clarify the translation and to remove multiple dependent claims from the application to reduce filing costs. Favorable consideration of this application is respectfully requested.

Respectfully submitted,

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## **ATTACHMENT FOR SPECIFICATION AMENDMENTS**

The following is a marked up version of the ABSTRACT section of the specification in which underlines indicates insertions and brackets indicate deletions.

### **ABSTRACT**

A self-assembled monolayer (SAM) is fabricated using either a semi-fluorinated sulphur containing compound, or a [sem]semi-fluorinated silane derivative and compressed carbon dioxide (CO<sub>2</sub>) as the solvent medium. The temperature and/or pressure of the compressed CO<sub>2</sub> may be varied during the fabrication process to improve the molecular packing density of the monolayer.

[By using compressed CO<sub>2</sub> as the solvent medium, monolayers with good molecular packing density can be fabricated relatively quickly without the use of environmentally unfriendly solvents.]

## **ATTACHMENT FOR CLAIM AMENDMENTS**

The following is a marked up version of each amended claim in which underlines indicates insertions and brackets indicate deletions.

1. (AMENDED) A method of fabricating a self-assembled monolayer of a substance on a substrate comprising depositing the substance on the substrate using compressed carbon dioxide as [the] a solvent medium for the substance.

2. (AMENDED) A method as claimed in claim 1, wherein [the] at least one of pressure [and/or] and temperature of the compressed carbon dioxide is[/are] selectively controlled so as to enhance [the] a density of the self-assembled monolayer on the substrate.

3. (AMENDED) A method as claimed in claim 1 [or 2] comprising the use of a co-solvent in combination with the compressed carbon dioxide.

4. (AMENDED) A method as claimed in claim 3, wherein the co-solvent comprises at least one of H<sub>2</sub>O, CH<sub>3</sub>OH, CF<sub>3</sub>OH, CF<sub>3</sub>CH<sub>2</sub>OH, CF<sub>3</sub>CF<sub>2</sub>OH, (CF<sub>3</sub>)<sub>2</sub>CHOH, CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, CHF<sub>3</sub>, CClF<sub>3</sub>, C<sub>2</sub>H<sub>6</sub>, SF<sub>6</sub>, Propylene, Propane, NH<sub>3</sub>, Pentane, <sup>i</sup>PrOH, MeOH, EtOH, <sup>i</sup>BuOH, Benzene, and Pyridine.



5. (AMENDED) A method as claimed in [any one of claims 1 to 4] claim 1, wherein the substrate comprises a metallic substance.

6. (AMENDED) A method as claimed in claim 5, wherein the metallic substance comprises at least one of gold, silver, copper, iron, mercury, palladium, gallium arsenide, ferrous oxide, and indium tin oxide.

9. (AMENDED) A method as claimed in claim 7 [or 8], wherein X comprises a thiol.

10. (AMENDED) A method as claimed in [any one of claims 7 to 9] claim 7, wherein Y comprises a CF<sub>3</sub> functional group.

11. (AMENDED) A method as claimed in [any one of claims 7 to 10] claim 7, wherein m and n lie within [the] a range of 1 to 20.

12. (AMENDED) A method as claimed in claim 11, wherein m and n lie within [the] a range of 5 to 10.

14. (AMENDED) A method as claimed in [any one of claims 7 to 13] claim 7, wherein Y further comprises at least one of vinyl, styryl, acryloyl, methacryloyl [or] and alkyne in combination with a spacer group.

15. (AMENDED) A method as claimed in claim 14, wherein the spacer group comprises at least one of  $\text{CH}_2$  [or] and  $\text{CF}_2$ .

16. (AMENDED) A method as claimed in [any one of claims 1 to 5] claim 1, wherein the substrate comprises at least one glass, mica,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , [or] and  $\text{Ga}_2\text{O}_3$ .

19. (AMENDED) A method as claimed in claim 18, wherein Si comprises at least one of  $\text{SiCl}_3$ ,  $\text{Si}(\text{OCH}_3)_3$ ,  $\text{Si}(\text{OCH}_2\text{CH}_3)_3$ ,  $\text{Si}(\text{OCH}_3)_2\text{Cl}$  [or] and  $\text{Si}(\text{CH}_2\text{CH}_3)_2\text{Cl}$ .

20. (AMENDED) A method as claimed in [any one of claims 17 to 19] claim 17, wherein Y comprises a  $\text{CF}_3$  functional group.

21. (AMENDED) A method as claimed in [any one of claims 17 to 19] claim 17, wherein m and n lie within [the] a range of 1 to 20.

22. (AMENDED) A method as claimed in claim 21, wherein m and n lie within [the] a range of 5 to 10.

24. (AMENDED) A method as claimed in [any one of claims 17 to 23] claim 17, wherein Y further comprises at least one of vinyl, styryl, acryloyl, methacryloyl [or] and alkyne in combination with a spacer group.

25. (AMENDED) A method as claimed in claim 24, wherein the spacer group comprises at least one of CH<sub>2</sub>[or] and CF<sub>2</sub>.

26. (AMENDED) A method as claimed in [any one of the preceding claims] claim 17, wherein the self-assembled monolayer has an ellipsometry thickness of about 30Å and a water contact angle of about 110°.